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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/667,390	09/23/2003	Tongbi Jiang	M4065.0906/P906	9376
24998	7590	08/24/2005	EXAMINER	
DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP 2101 L Street, NW Washington, DC 20037			WYATT, KEVIN S	
			ART UNIT	PAPER NUMBER

2878

DATE MAILED: 08/24/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/667,390	<b>Applicant(s)</b> JIANG ET AL.	
	<b>Examiner</b> Kevin Wyatt	<b>Art Unit</b> 2878	

**– The MAILING DATE of this communication appears on the cover sheet with the correspondence address –**  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 28 July 2005.  
2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 48-74 is/are pending in the application.  
    4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 48-55, 60-72 and 74 is/are rejected.  
7) ☒ Claim(s) 56-59 and 73 is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.  
10) ☒ The drawing(s) filed on 23 September 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
    a) ☐ All    b) ☐ Some \* c) ☐ None of:  
        1. ☐ Certified copies of the priority documents have been received.  
        2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
        3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>1203</u> . | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election with traverse of species II-2 in the reply filed on 7/28/2005 is acknowledged. The traversal is on the ground(s) that there is a reasonable number of independent claims where the subject matter is closely related, and therefore would not be a serious burden to examine all method claims pending at this time. This is not found persuasive because examining two species actually places a serious burden since two species are classified in different classes.

2. Claims 1-47 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected species, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 7/28/2005.

The requirement is still deemed proper and is therefore made FINAL.

### ***Drawings***

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "20", "21", "50", and "13", "12" in Fig. 3, and reference characters "20", "21", "32" in Fig. 3a, all have been used to designate the same elements. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate

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prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Claim Objections***

3. Claims 48, 51, 64, and 68 are objected to because of the following informalities:

In claim 48, line 4, "layer " should be changed to --layer;--.

In claim 51, line 6, "an" should be changed to --a--.

In claim 64, line 3, "layer " should be changed to --layer;--.

In claim 68, line 6, "an" should be changed to --a--.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 48-55, 60-61, 64-72 and 74 are rejected under 35 U.S.C. 102(b) as being anticipated by Fukusyo (U.S. Patent No. 6,066,511).

Regarding claim 48, Fukusyo shows in Figs. 1, and 2A-C, a method of fabricating an image sensor (20, i.e., imaging device) the method comprising: providing a substrate (2, i.e., substrate) comprising a plurality of photosensitive regions (3, i.e., photosensing portion) having photo sensors, and an upper substrate layer; providing a color filter array (12, i.e., color filter) on top of the upper substrate layer; applying a sacrificial material to the upper substrate layer (col. 5, lines 2-7); forming support molds (i.e., combination of interlayer insulating film (9), light shielding film (10) and overcoat layer (21)) in the sacrificial material; forming lens molds (22, i.e., recessed portion between support molds beneath overcoat layer) in the sacrificial material; forming supports (transfer electrode (8) ) by filling the support molds with a support material (21, i.e., overcoat layer); forming a first micro-lens array having first micro-lenses by filling the lens molds with a first micro-lens material (21 and 24, i.e., overcoat layer and lens layer); and removing the sacrificial material (col. 5, lines 2-7).

Regarding claim 49, Fukusyo shows in Figs. 2A and 2B a method of applying a sacrificial photo resist to the sacrificial material (col. 5, lines 2-7); applying a mask to the sacrificial photo resist and exposing support openings in the sacrificial photo resist (col. 5, lines 2-7); and etching the sacrificial material by applying a chemical etching solution to form support (i.e., combination of interlayer insulating film (9), light shielding film (10) and overcoat layer (21)) by etching through the support openings (col. 5, lines 2-7).

Regarding claim 50, Fukusyo discloses that the chemical etching solution is an anisotropic etching solution (col. 5, lines 2-7).

Regarding claim 51, Fukusyo shows in Figs. 2A and 2B a method comprising:

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applying a sacrificial photo resist to the sacrificial material (col. 5, lines 2-7); applying a mask to the sacrificial photo resist and exposing sacrificial resist openings in the sacrificial photo resist (col. 5, lines 2-7); etching the sacrificial material by applying a chemical etching solution to form lens molds (i.e., recessed portion beneath overcoat layer (21)) by etching through the sacrificial resist openings; and applying a rinse to stop the etching process (col. 5, lines 2-7).

Regarding claim 52, Fukusyo discloses that the chemical etching solution is an isotropic etching solution (col. 5, lines 2-7).

Regarding claim 53, Fukusyo discloses that the step the forming the support molds further comprises etching the support molds in the sacrificial material by controlled laser etching (i.e., thermal oxidation)(col. 5, lines 2-7).

Regarding claim 54, Fukusyo discloses that the step forming the lens molds (i.e., recessed portion beneath overcoat layer (21)) further comprises etching the lens molds in the sacrificial material by controlled laser etching (i.e., thermal oxidation)(col. 5, lines 2-7).

Regarding claim 55, Fukusyo discloses a method wherein said sacrificial material degrades upon heating to a degradation point, and the step of removing the sacrificial material comprises heating (i.e., thermal oxidation) the sacrificial material to at least the degradation point (col. 5, lines 2-7).

Regarding claim 60, Fukusyo discloses a method wherein said removing the sacrificial material comprises treating the sacrificial material with chemical resist solvents (col. 5, lines 2-7).

Regarding claim 61, Fukusyo shows in Figs. 1, and 2A-C a method wherein the support material is the first micro-lens material (21, i.e., overcoat layer).

Regarding claim 64, Fukusyo shows in Figs. 1, and 2A-C a method of fabricating an image sensor, the method comprising; providing a substrate comprising (2, i.e., substrate) a plurality of photosensitive regions (3, i.e., photosensing portion) having photo sensors, and an upper substrate layer; applying a sacrificial material (combination of interlayer insulating film (9), light shielding film (10) and overcoat layer (21)) above the upper substrate layer; forming lens molds (22, i.e., recessed portion between support molds beneath overcoat layer) in the sacrificial material; forming a micro-lens array having micro-lenses by filling the lens molds with a micro-lens material (21 and 24, i.e., overcoat layer and lens layer); and removing the sacrificial material (col. 5, lines 2-7).

Regarding claim 65, Fukusyo shows in Figs. 2A and 2B, a method comprising: forming support molds (i.e., portion of lens layer (24) covering overcoat layer (21)) in the sacrificial material; and forming supports (transfer electrode (8)) by filling the support molds with a support material.

Regarding claim 66, Fukusyo shows in Figs. 2A and 2B, a method comprising: applying a sacrificial photo resist to the sacrificial material (col. 5, lines 2-7); applying a mask to the sacrificial photo resist and exposing support openings in the sacrificial photo resist (col. 5, lines 2-7); and etching the sacrificial material by applying an chemical etching solution to form support molds (i.e., combination of interlayer

insulating film (9), light shielding film (10) and overcoat layer (21)) by etching through the support openings (col. 5, lines 2-7).

Regarding claim 67, Fukusyo discloses that the chemical etching solution is an anisotropic etching solution (col. 5, lines 2-7).

Regarding claim 68, Fukusyo shows in Figs. 2A and 2B, a method comprising: applying a sacrificial photo resist to the sacrificial material (col. 5, lines 2-7); applying a mask to the sacrificial photo resist and exposing sacrificial resist openings in the sacrificial photo resist (col. 5, lines 2-7); etching the sacrificial material by applying a chemical etching solution to form lens molds (22, i.e., recessed portion between support molds beneath overcoat layer) by etching through the sacrificial resist openings (col. 5, lines 2-7); and applying a rinse to stop the etching process (col. 5, lines 2-7).

Regarding claim 69, Fukusyo discloses a method wherein the chemical etching solution is an isotropic etching solution (col. 5, lines 2-7).

Regarding claim 70, Fukusyo discloses a method wherein the step the forming the lens molds further comprises etching the lens molds in the sacrificial material by controlled laser etching (col. 5, lines 2-7).

Regarding claim 71, Fukusyo discloses a method wherein said sacrificial material degrades upon heating to a degradation point, and the step of removing the sacrificial material comprises heating (i.e., thermal oxidation) the sacrificial material to at least the degradation point (col. 5, lines 2-7).

Regarding claim 72, Fukusyo discloses a method wherein method of claim 65 wherein the step of the forming the support molds further comprises etching the support



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molds in the sacrificial material by controlled laser etching (i.e., thermal oxidation)(col. 5, lines 2-7).

Regarding claim 74, Fukusyo shows in Figs. 2A and 2B, a method wherein the support material is the micro-lens material (21, i.e., overcoat layer).

6. Claims 62-63 are rejected under 35 U.S.C. 102(b) as being anticipated by Burger (U.S. Patent No. 6,381,072).

Regarding claim 62, Burger shows in Fig. 2, a method of fabricating an image sensor, the method comprising: providing a substrate (54a, i.e., substrate); forming one or more supports (58, i.e., opto-mechanical fixture) having distal and proximal ends wherein the distal ends are proximate the substrate (54a, i.e., substrate); and forming a first micro-lens array (56e, i.e., refractive lenslet array) supported by the supports at said proximal ends wherein a cavity (i.e., area between substrate 54b and substrate 54a) is formed below said first micro-lens array and above said substrate.

Regarding claim 63, Burger shows in Fig. 2, a method comprising forming a second micro-lens array (56c, i.e., non-refractive lenslet array) above the substrate (54a, i.e., substrate) and below the first micro-lens array wherein the distal ends of the supports are adjacent to the second micro-lens array and the cavity is formed above said second micro-lens array.

***Allowable Subject Matter***

7. Claims 56-59 and 73 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. The following is a statement of reasons for the indication of allowable subject matter:

Claims 56 and 73 are allowable because the prior art fails to disclose or make obvious, either singly or in combination, a method of fabricating an image sensor comprising, in addition to the other cited features of the claim, forming vacuum channels through the first micro-lens array wherein the distal ends of the vacuum channels are adjacent the sacrificial material; and using the vacuum channels to remove residual particles that remain in the image sensor after the step of removing the sacrificial material.

***Conclusion***

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Park (U.S. Patent No. 5,877,040) discloses a method of making charge-coupled device with microlens.

Shigeta (U.S. Patent No. 5,976,907) discloses a solid state imaging device and production method for the same.

Sano (U.S. Patent No. 6,030,852) discloses a solid state imaging device and method of manufacturing the same.


Nakai (Publication No. U.S. 2003/0168679 A1) discloses a semiconductor device and method of manufacturing the same.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin Wyatt whose telephone number is (571)-272-5974. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dave Porta can be reached on (571)-272-2444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
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